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ARI Research Note 90-80

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**Pertinent Factors that Affect  
the Representation of Women and  
Minorities in Scientific, Engineering,  
and Technical Careers**

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MAR 04 1991

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for

**Contracting Officer's Representative  
Laurel W. Oliver**

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**Office of Basic Research  
Michael Kaplan, Director**

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**United States Army  
Research Institute for the Behavioral and Social Sciences**

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Huston-Tillotson College

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## **FOREWORD**

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The career role of minorities and women in science, engineering, and technology (SET) is increasingly at issue as demographic trends in the United States indicate a smaller pool of 18- to 24-year olds, including a diminished white male cohort that has traditionally supplied most of the engineers and scientists in quantitative fields. Because the Department of Defense requires a substantial number of qualified technical personnel to carry out its mission, it may need to rely on a labor pool that includes a larger number of minorities and women in these careers.

Their report provides some preliminary findings concerning research done in this area, with the concentration on empirical studies.

# PERTINENT FACTORS THAT AFFECT THE REPRESENTATION OF WOMEN AND MINORITIES IN SCIENTIFIC, ENGINEERING, AND TECHNICAL CAREERS

## EXECUTIVE SUMMARY

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### Requirement:

To determine the variables that researchers have studied in their investigations of the causes of the underrepresentation of minorities and women in scientific, engineering, and technological (SET) careers, and to establish a database of relevant literature, particularly empirical studies.

### Procedure:

The first task was to determine the parameters of the extant literature. A multidisciplinary, intensive literature search had never been conducted on this subject. A search was conducted in order to measure the depth and range of the work performed in this area. A computerized search strategy resulted in 196 searches of data files, producing 9,082 references. Manual searches and referrals also produced relevant documents. Coding and further prioritizing resulted in the creation of the CASET database of 682 references, 370 of which are empirical studies. Key word searches of this database produced the data tabulated in this report, on women, American Indians, Anglos, Asian Americans, Blacks, and Hispanics.

### Findings:

There is consensus among disparate fields that increasing the participation of minorities and women in technical fields is necessary for the economic well-being and technological superiority of the United States. The most important research finding is that sex and race/ethnicity as a linked variable is rarely measured. That is, a research gap exists because of the paucity of studies of specific populations such as Black females or American Indian males. Additionally, there is no theoretical base into which to place the results of such systematic research.

### Utilization of Findings:

This interim report documents those factors considered by scientists to be important in understanding and solving the problem of increasing the participation of women and minorities in science and engineering careers. The report also suggests promising approaches to encouraging these populations to pursue SET careers. Application of these findings can give the DoD direction in what the key variables are and what needs to be done in the area of human resources to increase the pool of SETs available for employment in defense industries and installations.

**PERTINENT FACTORS THAT AFFECT THE REPRESENTATION OF WOMEN AND  
MINORITIES IN SCIENTIFIC, ENGINEERING, AND TECHNICAL CAREERS**

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# PERTINENT FACTORS THAT AFFECT THE REPRESENTATION OF WOMEN AND MINORITIES IN SCIENTIFIC, ENGINEERING, AND TECHNICAL CAREERS

## INTRODUCTION

### Background

For some time, the principal users of scientific and engineering personnel, the military, industry, and academia, have been concerned about a potential short supply of professionals in critical occupations vital to the economic and military security of the United States of America. Traditionally, most scientists and engineers have been drawn from a white, male labor pool. Today, however, this cohort is shrinking as part of the general decline in the number of 18-to-24 year olds in America. Concomitantly, the United States is becoming more technologically driven.

Significant changes have occurred in population growth since births began to decline in the early 1960s and dropped consistently during the subsequent 15-year period. Approximately all of the post-World War II baby-boom generation have now reached working age, and for the remainder of this century, America will experience a steady decline in the number of young persons entering the job market. As a consequence, labor shortages in general may be anticipated, assuming continued economic growth.

The human resources of the United States are its most important asset. This has been especially true of persons with scientific, engineering, and technological skills. The importance of the advancement of technology and science make it essential that the best talents be recruited from every available segment of the population. The Department of Defense may need to rely increasingly on minorities and women to engage in the science and engineering careers necessary for defense preparedness of the nation and for solutions to technological problems of the next decade and beyond.

### Objectives of Contract

As provided for in Contract MDA903-85-C-0342, the Center for the Advancement of Science, Engineering, and Technology (CASET) conducted an intensive and extensive literature search to identify references and documents describing and reporting on research which had been conducted on the subject of minorities and women in the pursuit and practice of careers in science, engineering, and technology (SETs), including computer science and mathematics. This interim report is one of the deliverables under that contract.

One purpose of the literature search is to identify the factors which influence women, American Indians, Asian Americans, Blacks, and Hispanics to choose, or conversely to reject, SET careers. Additionally, the search documents interventions or strategies which organizations and institutions have used to try to increase the participation of minorities and women in SET study and careers. The tabulation of the factors and interventions presents a research picture covering the variables measured, the populations involved, academic areas interested, the years of research efforts, and research setting.

The literature review was conducted to answer the following questions:

- What relevant literature exists on the subject of the SET career choices of minorities and women?
- What are the factors which influence SET career choice?
- What are the most promising approaches to interventions to increase the representation of women and minorities?
- What program elements have proved to be effective?
- What empirical studies have been conducted on this subject?

## METHOD

### Procedures

An extensive and intensive literature search was conducted to meet the above objectives. Since the literature was scattered among many disciplines, CASET initially determined approximately how many journals might be involved in the search. The total was 2,433 journals. (See Appendix A.) A computerized search of data files was deemed the most efficient way to approach the magnitude of the problem, and 196 searches were made resulting in 9,082 references, drawn from the physical, life, social, environmental, computer, mathematical, and behavioral sciences. (See Appendix B.)

These documents were augmented by a manual search, and by referrals, resulting in approximately 200 more documents. The literature also revealed a significant gap in data: nearly all the documents concerned university, college, community college, secondary, and elementary schools. That is, virtually no research had been done with technical or vocational schools, either public or proprietary.

Additionally, the literature revealed many studies funded by the Department of Labor (DOL) in the form of dissertations or monographs which were not available from the DOL. Many of the monographs reported on research using the National Longitudinal Survey (NLS) funded by the DOL, as

well as the Continuous Longitudinal Manpower Survey (CLMS).

A proposal submitted to the DOL resulted in Interagency Agreement Number 99-6-3375-98-010-03 whereby funds were provided to purchase the necessary materials, including 625 dissertations.

These numerous documents were first categorized (see Appendix C) into six groups, with Category A having the highest priority for achieving the objectives of the literature search. Criteria for Category A are:

A. Highest Criteria

1. Membership in subgroup of American Indian, Asian American, Black, Hispanic, or women.
2. United States of American citizenship.
3. Published document, including bibliographies, presented papers, and government reports.
4. About a SET subject.
5. About a ninth grade or above, postsecondary education, vocational training, or employment.

After categorization, the "A's" were coded. (See Appendix D.) At the time of this Interim Report, 682 documents have been coded, of which 370 are empirical studies.

The 682 documents constitute the computerized CASET database which was searched by key words in order to obtain the totals displayed in the RESULTS section.

## RESULTS

This section presents the tabulated findings of the literature search. The computerized search of the data files produced many more documents than expected by CASET or its advisory group. The volume of documents can be interpreted as a measure of the depth of the interest in the subject, while the variety of journals publishing can be seen as a measure of the range of the interest. The use of the stringent criteria for categorizing into "A's" still resulted in over 1300 references. (See Appendix E.) Further prioritizing based on the empirical (i.e. "primary") nature of a document reduced the number to the 682 which are contained in the CASET database.

The volume of literature called for several levels of categorization pertaining to "factors." All factors were found to fall into either a Cultural, Educational, Career, Economic, or Personal classification. These factors contain subsets or categories such as role model, expectations, counseling, and barriers.

## Characteristics of Documents

Tables 1-3 show the categories of the documents retrieved for the CASET database. The horizontal rows represent document types, a source categorization. Two document types dominate: (1) journal publications, representing 54% of the total, and (2) conference papers and/or conference proceedings, representing 13% of the total. The vertical columns represent the goal and focus of the publications, a content categorization. By design, empirical studies are the largest category, 54%. However, empirical study was broadly defined, it included all documents which reported data gathered by the author(s). Data was not necessarily statistically analyzed but could simply be tallied. Two columns verify the "quality" of the available literature - (1) anecdotal publications which represent 14% of the articles, and (2) evaluation reports which represent 1% of the articles.

Table 2 shows the categorizations for all primary studies<sup>1</sup>, 61% of all articles. As expected, empirical studies are the majority of entries. Table 3 shows the categorizations for all secondary studies<sup>2</sup>, publications which report other authors' results. Nearly one third of these are anecdotal. Also noteworthy is the paucity of evaluation reports. This could indicate that studies and interventions are not being tested and replicated only when their effectiveness has been established.

### Highlights:

- Anecdotal publications represent 14% of articles.
- Evaluations represent 1% of articles.
- One third of secondary studies are anecdotal.

---

<sup>1</sup> A more generalized term than empirical; refers to a study where author interacted with the population, including gathering anecdotal data, case studies, and some evaluation reports.

<sup>2</sup> A term used to describe studies where all data was gathered by a researcher other than the author.

Table 1

Goal and Focus of All Documents

Type	Goal and Focus								
	EMPIRICAL STUDY	RESEARCH REVIEW	THEORETICAL REVIEW	POSITION PAPER	ANECDOTAL	CASE STUDY	EVALUATION REPORT	OTHER	SUB-TOTAL
BOOK	3	2			3			2	10
BOOK CHAPTER	3								3
JOURNAL	190	32	1	38	66	11	4	24	366
GOVERNMENT REPORT	33	4		1	2		2	7	49
INDUSTRY REPORT	12	2	1		1			3	19
COLLEGE REPORT	31	2		1			2	4	40
DISSERTATION									
UNPUBLISHED MANUSCRIPT									
CONFERENCE PAPER	63	5	1	9	2		1	11	92
BIBLIOGRAPHY								13	13
AUDIO-VISUAL								1	1
INSTRUCTIONAL MATERIALS				2	1			6	9
MANUAL/ HANDBOOK				1				6	7
OTHER	35	5		6	18	1		8	73
SUB-TOTAL	370	52	3	58	93	12	9	85	602



Table 2

Goal and Focus of Primary Documents

Type	Goal and Focus								
	EMPIRICAL STUDY	RESEARCH REVIEW	THEORETICAL REVIEW	POSITION PAPER	ANECDOTAL	CASE STUDY	EVALUATION REPORT	OTHER	SUB-TOTAL
BOOK	3							2	5
BOOK CHAPTER	3								3
JOURNAL	190				15	1		4	210
GOVERNMENT REPORT	33						1	2	36
INDUSTRY REPORT	12							1	13
COLLEGE REPORT	31						2	2	35
DISSERTATION									
UNPUBLISHED MANUSCRIPT									
CONFERENCE PAPER	63				1		1	2	67
BIBLIOGRAPHY									
AUDIO-VISUAL									
INSTRUCTIONAL MATERIALS					1			3	4
MANUAL/ HANDBOOK								4	4
OTHER	35				1	1		3	40
SUB-TOTAL	370				18	2	4	23	417

Note. Data are based on primary studies.

Table 3

Goal and Focus of Secondary Documents

Type	Goal and Focus								
	EMPIRICAL STUDY	RESEARCH REVIEW	THEORETICAL REVIEW	POSITION PAPER	ANECDOTAL	CASE STUDY	EVALUATION REPORT	OTHER	SUB-TOTAL
BOOK		2			3				5
BOOK CHAPTER									
JOURNAL		32	1	38	51	10	4	20	156
GOVERNMENT REPORT		4		1	2		1	5	13
INDUSTRY REPORT		2	1		1			2	6
COLLEGE REPORT		2		1				2	5
DISSERTATION									
UNPUBLISHED MANUSCRIPT									
CONFERENCE PAPER		5	1	9	1			9	25
BIBLIOGRAPHY								13	13
AUDIO-VISUAL								1	1
INSTRUCTIONAL MATERIALS				2				3	5
MANUAL/ HANDBOOK				1				2	3
OTHER		5		6	17			5	33
SUB-TOTAL		52	3	58	75	10	5	62	265

Note. Data are based on secondary studies.

Tabulation of the locations of the empirical studies by geographic region (Table 4) reveals that uni-institutional studies are fairly evenly distributed across the United States, with the exception of the Southwest which is low. There is also a paucity of research being conducted in industrial and governmental settings.

Highlights:

- Minimal research conducted in industrial settings.
- Minimal research conducted in governmental settings.
- Over one-third of the research is multi-institutional.

Table 4

Location of Primary Studies

REGION	SETTING			TOTAL
	EDUCATIONAL	INDUSTRIAL	GOVERNMENTAL	
NORTHEAST	29	4	0	34
SOUTHEAST	26	2	2	30
MIDWEST	34	0	1	35
WEST	31	0	0	31
SOUTHWEST	17	1	0	18
MULTI-INSTITUTIONAL	131	7	4	142
UNSPECIFIED	93	6	13	112
TOTAL	361	20	20	402

Note.

Northeast includes Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, Pennsylvania, New Jersey and Delaware.

Southeast includes Arkansas, Louisiana, Kentucky, West Virginia, Virginia, North Carolina, South Carolina, Tennessee, Mississippi, Alabama, Georgia, Florida, and Maryland.

Midwest includes Minnesota, Wisconsin, Michigan, Iowa, Illinois, Indiana, Ohio, and Missouri.

West includes Washington, Oregon, California, Nevada, Montana, Idaho, Utah, Wyoming, Colorado, North Dakota, South Dakota, Nebraska, Kansas, Alaska, and Hawaii.

Southwest includes Arizona, New Mexico, Texas, and Oklahoma.

Table 5 shows the list of journals which published documents on the CASET database by year of publication. Major journals (those with over six relevant articles) are Chemical and Engineering News (32), Educational and Psychological Measurement (7), Engineering Education (35), IEEE Transaction on Education (10), Journal of College Student Personnel (7), Journal of Counseling Psychology (12), Journal of Research in Science Teaching (12), Journal of Vocational Behavior (11), School Science and Mathematics (7), and Science (12). During the years 1974 to 1985, journal publications averaged 26, with a peak of 45 in 1983. A total of 381 documents were published from the 1950s to present.

Highlights:

- Education and teaching journals publish most.
- Number of publications peaked in 1983 with 45.
- 147 journals published documents.

Table 5

Published Journal Articles by Year

Journal	Number of documents																			
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
ACCOUNTANT										1										1
ACTION IN TEACHER EDUCATION																		1		1
AGB REPORTS																1				1
AGENDA																1				1
ALBERTA JOURNAL OF EDUCATION RESEARCH																		1		1
AMERICAN BIOLOGY - TEACHER										1						1				2
AMERICAN DEMOGRAPHICS																		1		1
AMERICAN EDUCATION										1						1	1			3
AMERICAN EDUCATIONAL RESEARCH JOURNAL											1					1	1	1		4
AMERICAN EDUCATOR THE PROFESSIONAL JOURNAL OF THE AMERICAN FEDERATION																	1			1
AMERICAN JOURNAL OF PHYSICS						1				1										2
AMERICAN JOURNAL OF SOCIOLOGY											1									1
AMERICAN MATHEMATICAL MONTHLY										1	2					1	1	1		6
AMERICAN PSYCHOLOGIST																		1	2	3
AMERICAN SCIENTIST																	1			1
ANNUAL OF THE AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE						1														1
ATA EDUCATION RESEARCH BULLETIN											1									1
BIOSCIENCE										1						1				2

Table 5 Continued

Published Journal Articles by Year

Journal	Number of documents																			
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
BLACK ENTERPRISE									1									1		2
BUSINESSWEEK										1										1
CHANGE									1		1	1		1						4
CHANGE REPORT ON TEACHING									1											1
CHEMICAL AND ENGINEERING NEWS					1	1	3	3	5	1	2	1	3	2	2	2	2	4	2	32
CHEMICAL ENGINEERING		1																		1
CHEMICAL WEEK											1									1
COLLEGE AND UNIVERSITY															1					1
COLLEGE BOARD REVIEW											1									1
COLLEGE STUDENT JOURNAL											1									1
COMMUNITY AND JUNIOR COLLEGE JOURNAL											1									1
COMMUNITY COLLEGE FRONTIERS											1									1
COMMUNITY COLLEGE REVIEW									1											1
COMMUNITY JUNIOR COLLEGE RESEARCH QUARTERLY											1			1						2
COMPUTER WORLD											2									2
CONNECTIONS															1					1
CONTEMPORARY EDUCATION					1															1
CRISES															1					1

Table 5 Continued

Published Journal Articles by Year

Journal	Number of Documents																			
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	TOTAL
DATAMATION																	1			1
DISCOVER																	1			1
EDUCATION					1											1				2
EDUCATIONAL AND PSYCHOLOGICAL MEASUREMENT		1						1					1	1		1		1		7
EDUCATIONAL HORIZONS									1								2			3
EDUCATIONAL LEADERSHIP																	1			1
EDUCATIONAL RESEARCH QUARTERLY																1				1
EDUCATIONAL STUDIES IN MATHEMATICS																	1	1		2
EDUCATIONAL TECHNOLOGY													1							1
ELEMENTARY SCHOOL JOURNAL								1												1
ENGINEERING EDUCATION			1					2		6	3	1	3	2	5		4	6	2	35
GCT																		1		1
GEOTIMES					1			3									1			5
GRADUATE WOMAN																1				1
GRADUATE WOMEN															1					1
HIGH SCHOOL JOURNAL																1				1
IEEE SPECTRUM																	1	1		2
IEEE TRANSACTION ON EDUCATION								2	4	1		1						2		10



Table 5 Continued

Published Journal Articles by Year

Journal	Number of documents																			
	1960s	1961s	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
IEEE TRANSACTIONS ON POWER APPARATUS AND SYSTEMS							1													1
ILLINOIS TEACHER OF HOME ECONOMICS																	1			1
IMPACT OF SCIENCE ON SOCIETY							4													4
INDUSTRIAL RELATIONS															1					1
INDUSTRY WEEK							1						1	1						3
INTEGRATED EDUCATION				1									1	1	1					4
INTELLIGENCE												1	1							2
INTERNATIONAL JOURNAL OF WOMENS STUDIES																1				1
ISIS											1		1							2
JOURNAL FOR RESEARCH IN MATHEMATICAL EDUCATION														1						1
JOURNAL FOR RESEARCH IN MATHEMATICS EDUCATION													1		1		1			3
JOURNAL FOR THE EDUCATION OF THE GIFTED											1									1
JOURNAL OF AMERICAN INDIAN EDUCATION																1				1
JOURNAL OF CHEMICAL EDUCATION							1				2							2		5
JOURNAL OF CHEMICAL ENGINEERING																1				1
JOURNAL OF COLLEGE PLACEMENT		1																		1
JOURNAL OF COLLEGE SCIENCE TEACHING										1				1		2				4
JOURNAL OF COLLEGE STUDENT PERSONNEL										1	1		1		1		1	2		7

Table 5 Continued

Published Journal Articles by Year

Journal	Number of documents																			
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	TOTAL
JOURNAL OF CONSULTING AND CLINICAL PSYCHOLOGY				1																1
JOURNAL OF COUNSELING PSYCHOLOGY		1			1			2		2		1					2	1	2	12
JOURNAL OF EDUCATIONAL COMPUTER RESEARCH																		1		1
JOURNAL OF EDUCATIONAL MEASUREMENT																	1			1
JOURNAL OF EDUCATIONAL PSYCHOLOGY									1									1		2
JOURNAL OF EDUCATIONAL RESEARCH							1													1
JOURNAL OF EMPLOYMENT COUNSELING																		1		1
JOURNAL OF ENGINEERING EDUCATION					1															1
JOURNAL OF GENETIC PSYCHOLOGY										1										1
JOURNAL OF HIGHER EDUCATION																			1	1
JOURNAL OF LABOR RESEARCH																	1			1
JOURNAL OF NEGRO EDUCATION							1			1							1		1	4
JOURNAL OF NON-WHITE CONCERNS IN PERSONNEL AND OUTRAGE						1												1		2
JOURNAL OF PROFESSIONAL ACTIVITIES AMERICAN SOCIETY OF CIVIL ENG.									1											1
JOURNAL OF PSYCHOLOGY									2									1		3
JOURNAL OF RESEARCH IN SCIENCE TEACHING																2	2	1	5	12
JOURNAL OF SOCIAL ISSUES																		1		1
JOURNAL OF VOCATIONAL BEHAVIOR										4	1					1	2	2		11

Table 5 Continued

Published Journal Articles by Year

Journal	Number of documents																			
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	TOTAL
LIBERAL EDUCATION									1											1
MANPOWER							1													1
MARKETING NEWS																		1		1
MATHEMATICS TEACHER									1		1									2
MEASUREMENT AND EVALUATION IN GUIDANCE						2												1		3
MINERVA							1													1
MINING ENGINEERING											1									1
MONEY							1											1		3
MOSAIC							1				1		1							3
MS MAGAZINE							1													1
NATURAL HISTORY									1											1
NEGRO HISTORY BULLETIN	1																			1
NEW PERSPECTIVES																		1		1
NUESTRO																		1		1
OCCUPATIONAL OUTLOOK QUARTERLY										1	1									2
PERCEPTUAL AND MOTOR SKILLS									1											1
PERSONNEL AND GUIDANCE JOURNAL				1						1			2							4
PERSONNEL PSYCHOLOGY									1											1

Table 5 Continued

Published Journal Articles by Year

Journal	Number of documents																			
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
PHI DELTA KAPPAN																		1		1
PHI KAPPA JOURNAL																		1		1
PHYSICS TEACHER			1		2	1												1		5
PHYSICS TODAY				1						1						1	1	1	1	6
POULTRY SCIENCE										1										1
PSYCHOLOGICAL BULLETIN																		1		1
PSYCHOLOGICAL REPORTS																			1	1
PSYCHOLOGY OF WOMEN QUARTERLY																	1	2	2	6
PUBLIC PERSONNEL MANAGEMENT																		1		1
PURDUE OPINION PANEL POLL REPORT									1											1
RESEARCH MANAGEMENT																	1			1
REVIEW OF EDUCATIONAL RESEARCH																			1	1
REVIEW OF HIGHER EDUCATION																			1	1
RURAL SOCIOLOGY																	1			1
SCHOOL COUNSELOR										1										2
SCHOOL SCIENCE AND MATHEMATICS						1				1	1							1	1	7
SCIENCE	1		1					1	2	1		2						1	2	12
SCIENCE EDUCATION																				1
SCIENCE NEWS									1	1								1	1	4

Table 5 Continued

Published Journal Articles by Year

Journal	Number of documents																			
	1964	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
SCIENCE TEACHER						2		1		1	1			1						6
SCIENCE TECHNOLOGY AND HUMAN VALUES																1				1
SEX ROLES												1				1				2
SIGNS											2									2
SIGNS JOURNAL OF WOMEN IN CULTURE AND SOCIETY											2									2
SOCIAL FORCES			1																	1
SOCIAL SCIENCE JOURNAL												1								1
SOCIAL SCIENCE QUARTERLY																1				1
SOCIOLOGICAL INQUIRY											1									1
SOCIOLOGICAL SPECTRUM														1		1				2
SPACE FLIGHT								1												1
TECHNOLOGY REVIEW																2				2
TELEPHONY																1				1
TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY																1				1
VITAL SPEECHES														1						1
VOCATIONAL EDUCATION JOURNAL																	1			1
VOCATIONAL GUIDANCE QUARTERLY													1			1				2
VOC ED															1					1
WOMAN CPA								1												1
WOMEN IN BUSINESS																1				1
WORKING WOMAN																1		1		2
TOTAL	1	5	4	4	8	10	17	20	26	21	33	25	32	34	30	45	34	29	3	391

Table 6

All Documents by Sex and Race/Ethnicity

Population	Number of Documents				Total
	Males and Females	Males	Females	Not Specified	
American Indians	13	1	2	35	51
Anglo	27	0	8	19	54
Asian Americans	13	0	1	22	36
Black	45	1	4	48	98
Hispanic	29	0	3	46	78
Other	7	0	0	4	11
Mixed Minority	6	0	0	8	14
Unspecified	217	1	108	104	430
All Studies	276	2	120	284	682

Tables 7-9 show the publications dates of documents by ethnic populations. Clearly 1981-1984 represent the bulk of the publications. Therefore, the research was most likely performed in the period of 1977-1980, when funding was easier to acquire. (Because 1986 searches have not been performed, these numbers are incomplete.) With the exception of a few studies on Blacks, minority studies did not get started until 1974 or 1975. Of the minorities studied, Blacks and Hispanics receive the most attention. Unfortunately the majority of studies (430 or 63%) give no information on ethnicity, and their value for this project is decreased. It is interesting to note that 94% of the studies on Anglos are primary whereas most other populations have 68% - 75% of studies which are primary.

Highlights:

- Study of minorities begins in 1974 or 1975.
- Compared with the other ethnic groups, projects on Anglo populations contain far more primary studies.
- Most research was published from 1981 to 1984.

Table 7

Populations of All Documents by Year

Population	Number of documents																			
	1950s	1960s	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
American Indian							1	1	1	3	6	1	3	4	11	7	6	5	2	51
Anglo						1		4	5	1	2	2	4	5	6	10	6	6	2	54
Asian American					1		1	1	3	1	1		2	3	4	3	5	9	1	36
Black			2	2		3	7	3	5	6	5	5	4	10	10	12	12	8	3	98 <sup>a</sup>
Hispanic					1		3	1	2	1	5	3	8	10	15	10	9	9	1	78
Mixed Minority							1	1	1		1		1	2	2	2	1	2		14
Unspecified	1	8	2	1	5	8	9	14	21	22	39	35	34	54	47	49	50	28	2	430 <sup>a</sup>
Other								2	1					2	2	1	1	2		11
TOTALS	1	8	4	3	7	12	22	27	39	34	59	46	56	91	97	94	90	69	11	772

<sup>a</sup>Includes one study not dated.



Table 8

Populations of Primary Documents by Year

Population	Number of documents																			
	1950s	1960s	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
American Indian							1	1		1	4	1	2	3	8	6	4	3	1	35
Anglo						1		3	5	1	2	2	4	4	6	10	6	5	2	51
Asian American					1		1	1	3	1			2	3	3	3	4	4	1	27
Black			1	2		1	5	3	4	4	4	4	4	7	7	10	7	5	3	72 <sup>a</sup>
hispanic					1		2	1	2	1	3	2	7	7	12	9	5	5	1	58
Mixed Minority									1		1		1		1	2		2		8
Unspecified	1	7	1	1	3	7	7	5	12	12	25	24	20	37	37	35	34	21	1	291 <sup>a</sup>
Other								2	1					2	1	1	1	2		10
TOTALS	1	7	2	3	5	9	16	16	28	20	39	33	40	63	75	76	61	47	9	552

Note. Data are based on primary studies.

<sup>a</sup>Includes one study not dated.

Table 9

Populations of Secondary Documents by Year

Population	Number of documents																			
	1950s	1960s	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
American Indian									1	2	2		1	1	3	1	2	2	1	16
Anglo								1						1				1		3
Asian American											1			1	1		1	5		9
Black			1			2	2		1	2	1	1		3	3	2	5	3		26
Hispanic							1				2	1	1	3	3	1	4	4		20
Mixed Minority							1	1						2	1		1			6
Unspecified		1	1		2	1	2	9	9	10	14	11	14	17	10	14	16	7	1	139
Other															1					1
TOTALS		1	2		2	3	6	11	11	14	20	13	16	28	22	18	29	22	2	220

Note. Data are based on secondary studies.

Tables 10-12 show the publication dates of studies by sex. Studies with all female populations were not plentiful until 1975; thereafter, the number of publications appear to peak and decline in a cyclical pattern. Also relevant is the kind of population referenced in secondary (less important) studies - 40% have female populations and 57% have unspecified populations.

Highlights:

- Studies of only female populations increase in 1975.
- Secondary studies often do not specify the populations by sex.
- Only one study had a population of only males.

Table 10

All Documents by Sex of Population and Year of Publication

Population	Number of documents																			
	1950	1960	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
Male And Female	1	5	2	1	1	6	5	5	12	11	23	24 <sup>a</sup>	22	41	33	35 <sup>a</sup>	29	18	2	278 <sup>b</sup>
Female Only		2	1	1	3	2	1	9	8	4	18	9	8	11	6	20	9	7	1	120
Unspecified		5	2	3	5	6	16	13	14	15	14	18	27	23	35	26	36	22	4	284
TOTAL	1	12	5	5	9	14	22	27	34	30	55	51	57	75	74	81	74	47	7	682

<sup>a</sup>Includes one study with male participants only.

<sup>b</sup>Includes two studies not dated.

Table 11

Primary Documents by Sex of Population and Year of Publication

Population	Number of documents																			
	1950	1960	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
Male And Female	1	4	2	1	1	5	4	2	8	9	18	19 <sup>a</sup>	14	31	29	31	24	14	1	220 <sup>b</sup>
Female Only		2		1	1	2	1	4	6	2	10	6	4	6	5	13	5	4	1	73
Unspecified		3	1	2	4	2	7	5	6	4	5	4	14	8	19	11	16	10	3	124
TOTAL	1	9	3	4	6	9	12	11	20	15	33	29	32	45	53	55	45	28	5	417

Note. Data are based on primary studies.

<sup>a</sup>Includes one study with male participants only.

<sup>b</sup>Includes two studies not dated.

Table 12

Secondary Documents by Sex of Population and Year of Publication

Population	Number of documents																			
	1950s	1960s	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
Male And Female		1				1	1	3	4	2	5	5	8	10	4	4 <sup>a</sup>	5	4	1	58
Female Only			1		2			5	2	2	8	3	4	5	1	7	4	3		47
Unspecified		2	1	1	1	4	9	8	8	11	9	14	13	15	16	15	20	12	1	160
TOTAL		3	2	1	3	5	10	16	14	15	22	22	25	30	21	26	29	19	2	265

Note. Data are based on secondary studies only.

<sup>a</sup>Includes one study with male participants only.

## Overview of All Factors

Tables 13-14 show summary data of the coding sheet factors by ethnic/racial groups and by gender. The first table is for the entire 682 documents. As might be expected, educational factors and personal factors dominate the literature. The largest number of documents based on American Indians are those studies without gender specification. Studies on Anglos generally specify gender. The largest number of all female studies is with Anglos. Educational and career factors have the same number of citations. The least amount of information available is on Asian Americans! Factors affecting this population appear to be rather equally discussed in the literature. The largest number of studies on one ethnic/racial group is on Blacks. 82% of these studies mention educational factors. Hispanic populations represent the second largest number of studies of a particular ethnic/racial group. These studies indicate cultural factors are more significant to Hispanics than any other population, having citations in 60% of the articles. Other populations are too small to make generalizations. Table 14 is for the empirical studies only. Similar conclusions may be drawn.

### Highlights:

- Educational and personal factors dominate the literature.
- Asian American populations are studied the least.
- Black populations are studied the most.
- Cultural factors are cited frequently in studies on Hispanics.

Table 13

Overview of Factors by Populations in All Documents

ETHNIC/RACIAL GROUP BY GENDER		FACTORS				
		CULTURAL	EDUCATIONAL	CAREER	PERSONAL	ECONOMIC
American Indian	51	23	43	18	33	14
male/female	14	9	13	5	10	5
female only	2	1	1	1	0	1
unspecified	35	13	29	12	23	8
Anglo	54	31	41	27	41	6
male/female	27	19	22	14	24	3
female only	8	3	5	6	5	1
unspecified	19	9	14	7	12	2
Asian American	36	15	22	16	20	8
male/female	13	6	8	6	10	4
female only	1	0	1	0	0	1
unspecified	22	9	13	10	10	3
Black	98	51	80	47	65	29
male/female	46	29	41	22	40	11
female only	4	2	3	1	1	1
unspecified	48	20	36	24	24	17
Hispanic	78	47	64	29	54	23
male/female	29	20	26	13	24	10
female only	3	1	3	1	2	2
unspecified	46	26	35	15	28	11
Other	11	5	8	4	7	1
male/female	7	3	6	2	5	1
female only	0	0	0	0	0	0
unspecified	4	2	2	2	2	0
Mixed Minority	14	5	12	4	10	2
male/female	6	2	6	2	5	0
female only	0	0	0	0	0	0
unspecified	8	3	6	2	5	2
Unspecified	430	236	337	225	310	66
male/female	218	107	166	102	167	24
female only	108	68	91	71	81	15
unspecified	104	61	80	52	62	27
All Studies	682	358	523	334	453	119
male/female	278	144	220	127	214	41
female only	120	74	99	79	88	17
unspecified	284	140	204	128	151	61

Note. Data are based on 682 documents.



Table 14

Overview of Populations by Factors in Empirical Studies

ETHNIC/RACIAL GROUP BY GENDER		FACTORS				
		CULTURAL	EDUCATIONAL	CAREER	PERSONAL	ECONOMIC
American Indian	29	12	22	8	16	8
male/female	8	5	7	2	5	3
female only	1	0	1	0	0	1
unspecified	20	7	14	6	11	4
Anglo	47	27	36	21	35	5
male/female	25	17	20	13	22	2
female only	3	1	2	1	1	1
unspecified	19	9	14	7	12	2
Asian American	26	9	15	9	13	3
male/female	10	5	6	4	7	1
female only	1	0	1	0	0	1
unspecified	15	4	8	5	6	1
Black	66	33	50	28	44	15
male/female	35	21	30	16	29	7
female only	4	2	3	1	1	1
unspecified	27	10	17	11	14	7
Hispanic	56	30	44	19	39	12
male/female	20	12	17	9	16	4
female only	3	1	3	1	2	2
unspecified	33	17	24	9	21	6
Other	9	5	7	2	6	0
male/female	6	3	5	1	4	0
female only	0	0	0	0	0	0
unspecified	3	2	2	1	2	0
Mixed Minority	6	2	6	2	5	0
male/female	5	2	5	2	4	0
female only	0	0	0	0	0	0
unspecified	1	0	1	0	1	0
Unspecified	272	141	214	112	210	33
male/female	160	77	124	61	130	15
female only	58	36	53	32	46	8
unspecified	54	28	37	19	34	10
All Studies	370	190	286	145	270	54
male/female	203	103	162	78	162	23
female only	64	39	58	34	49	10
unspecified	103	48	66	33	59	21

Note. Data are based on 370 empirical studies.

Tables 15-18 show the number of documents which mention the factors contained in the coding sheet. These tables, with categories for total, primary, secondary, and empirical studies, have totals larger than the number of documents because more than one factor may be mentioned in a document. Of the 682 documents, 358 (52%) discuss cultural factors, 523 (77%) discuss educational factors, 334 (49%) discuss career factors, 453 (66%) discuss personal factors, and 119 (17%) discuss economic factors. It is surprising to note the apparent importance of cultural factors as well as the apparent unimportance of economic factors. Of the 682 documents, 252 (37%) discuss counseling, 257 (38%) discuss expectations, 289 (42%) discuss role models, 337 (49%) discuss retention, 212 (31%) discuss recruitment, 393 (58%) discuss barriers, 227 (33%) discuss test scores and/or grades, 350 (51%) discuss educational curricula, 285 (42%) discuss personal abilities, and 371 (54%) discuss personal attitudes. Barriers are mentioned in over half of the studies so the problem is at least recognized. However, these numbers indicate analysts could be missing the boat. Retention efforts require subjects that have entered SET programs, i.e. been recruited! More emphasis should be placed on the recruitment process.

#### Highlights:

- Educational factors is the classification which has variables measured or discussed most frequently.
- Barriers is the individual variable measured or mentioned most frequently with retention second.
- Economic factors receive little attention.
- Career factors focus on expectations, not on special retention/recruitment programs and policies.

Table 15

Factors in All Documents

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	39	108	123	128	11	240					105	754
EDUCATIONAL FACTORS	240	76	231	188	149	218	227	350			128	1807
CAREER FACTORS	20	171	44	158	88	131					55	667
PERSONAL FACTORS		25							285	371	124	805
ECONOMIC FACTORS						62					9	71
SUB-TOTAL	299	380	398	474	248	651	227	350	285	371	421	4104

Note. Data are based on 682 studies.

Table 16

Factors in Primary Documents

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	23	58	94	85	7	129					92	488
EDUCATIONAL FACTORS	144	54	144	112	74	121	180	227			124	1180
CAREER FACTORS	7	160	20	72	31	55					50	335
PERSONAL FACTORS		16							190	245	121	572
ECONOMIC FACTORS						36					9	45
SUB-TOTAL	174	228	258	269	112	341	180	227	190	245	396	2620

Note. Data are based on 417 primary studies.

Table 17

Factors in Secondary Documents

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	16	50	29	43	4	111					13	266
EDUCATIONAL FACTORS	96	22	87	76	75	97	47	123			4	627
CAREER FACTORS	13	71	24	86	57	76					5	332
PERSONAL FACTORS		9							95	126	3	233
ECONOMIC FACTORS						26						26
SUB-TOTAL	125	152	140	205	136	310	47	123	95	126	25	1484

Note. Data are based on 265 secondary studies.

Table 18

Factors in Empirical Documents

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	20	54	86	72	7	115					84	438
EDUCATIONAL FACTORS	116	52	119	91	55	109	168	194			108	1012
CAREER FACTORS	6	90	16	63	25	45					41	286
PERSONAL FACTORS		15							167	214	110	506
ECONOMIC FACTORS						32					7	39
SUB-TOTAL	142	211	221	226	87	301	168	194	167	214	350	2281

Note. Data are based on 370 empirical studies.

### Factors by Population

Tables 19-22 show the summaries on American Indians. Only 51 documents (7%) discuss this population, half of which are empirical studies. Findings on educational factors dominate the literature. Unfortunately, almost no information is available on career factors for the American Indian. Only two empirical studies discuss retention and none refer to career recruitment!

### Highlights:

- Only 7% of the studies have populations with American Indians.
- Little information is available on economic factors.
- No information is available on cultural factors and recruitment.
- Educational factors are reported most frequently.

Table 19

All Documents on American Indians by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	5	9	11	11		15					7	58
EDUCATIONAL FACTORS	21	9	16	19	16	19	22	33			16	171
CAREER FACTORS		6	2	5	4	3					2	22
PERSONAL FACTORS									17	29	8	54
ECONOMIC FACTORS						5					3	8
SUB-TOTAL	26	24	29	35	20	42	22	33	17	29	36	313

Note. Data are based on 51 studies on American Indians.



Table 20

Primary Documents on American Indians by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	4	6	8	8		6					6	38
EDUCATIONAL FACTORS	11	6	11	11	10	12	18	22			16	117
CAREER FACTORS		2	1	3	3						2	11
PERSONAL FACTORS									10	17	8	35
ECONOMIC FACTORS						4					3	7
SUB-TOTAL	15	14	20	22	13	22	18	22	10	17	35	208

Note. Data are based on 35 primary studies on American Indians.

Table 21

Secondary Documents on American Indians by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	1	3	3	3		9					1	20
EDUCATIONAL FACTORS	10	3	5	8	6	7	4	11				54
CAREER FACTORS		4	1	2	1	3						11
PERSONAL FACTORS									7	12		19
ECONOMIC FACTORS						1						1
SUB-TOTAL	11	10	9	13	7	20	4	11	7	12	1	105

Note. Data are based on 16 secondary studies on American Indians.

Table 22

Empirical Documents on American Indians by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	3	5	8	7		6					5	34
EDUCATIONAL FACTORS	7	6	9	9	9	10	16	17			13	96
CAREER FACTORS	7	2	1		2						2	14
PERSONAL FACTORS									9	14	6	29
ECONOMIC FACTORS						3					2	5
SUB-TOTAL	17	13	18	16	11	19	16	17	9	14	28	178

Note. Data are based on 29 empirical studies on American Indians.

Tables 23-26 show the summaries on Anglos. Only 54 documents (8%) discuss this population, most of which are empirical studies. The literature references role models almost as often as barriers for Anglos. As in the case of the American Indian, studies are less concerned with career factors.

Highlights:

- Most studies are empirical.
- Information on role models and barriers are reported the most.
- Little information is available on economic factors.

Table 23

All Documents with Anglos by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	4	12	19	11	1	19					14	80
EDUCATIONAL FACTORS	15	9	18	9	9	19	29	34			16	158
CAREER FACTORS	1	13	4	13	4	7					11	53
PERSONAL FACTORS		1							21	32	15	69
ECONOMIC FACTORS						4					1	5
SUB-TOTAL	20	35	41	33	14	49	29	34	21	32	57	365

Note. Data are based on 54 studies on Anglos.

Table 24

Primary Documents with Anglos by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	4	11	18	11	1	18					14	77
EDUCATIONAL FACTORS	13	9	16	8	8	18	28	32			16	148
CAREER FACTORS	1	12	2	12	3	5					11	46
PERSONAL FACTORS		1							20	29	15	65
ECONOMIC FACTORS						4					1	5
SUB-TOTAL	18	33	36	31	12	45	28	32	20	29	57	341

Note. Data are based on 51 primary studies on Anglos.

Table 25

Secondary Documents with Anglos by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS		1	1			1						3
EDUCATIONAL FACTORS	2		2	1	1	1	1	2				10
CAREER FACTORS		1	2	1	1	2						7
PERSONAL FACTORS									1	3		4
ECONOMIC FACTORS												
SUB-TOTAL	2	2	5	2	2	4	1	2	1	3		24

Note. Data are based on three secondary studies on Anglos.

Table 26

Empirical Documents with Anglos by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	4	11	18	9	1	16					14	73
EDUCATIONAL FACTORS	13	9	15	7	7	16	28	30			16	141
CAREER FACTORS	1	10	1	9	3	3					10	37
PERSONAL FACTORS									18	27	15	60
ECONOMIC FACTORS						3					1	4
SUB-TOTAL	18	30	34	25	11	38	28	30	18	27	56	315

Note. Data are based on 47 empirical studies on Anglos.



Tables 27-30 show the summaries on Asian Americans. Only 35 documents (5%) discuss this population, most of which are empirical studies. Conclusions drawn from this small of a sample may be misleading. However, in general, the representation across factors is more balanced. The literature is not over-emphasizing any one category to the exclusion of another.

Highlights:

- Only 5% of the studies have populations with Asian Americans.
- Most studies are empirical.
- No particular factor is proportionately over or under represented.

Table 27

All Documents with Asian Americans by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	2	7	6	6		10					6	37
EDUCATIONAL FACTORS	8	6	8	8	6	8	15	20			7	66
CAREER FACTORS	1	6	1	10	2	3					6	29
PERSONAL FACTORS									12	16	7	35
ECONOMIC FACTORS						2					1	3
SUB-TOTAL	11	19	15	24	8	23	15	20	12	16	27	190

Note. Data are based on 36 studies on Asian Americans.

Table 28

Primary Documents with Asian Americans by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	2	5	5	4		5					3	24
EDUCATIONAL FACTORS	5	5	8	5	5	7	12	14			7	68
CAREER FACTORS	1	3	1	6	2	1					6	20
PERSONAL FACTORS									6	10	7	23
ECONOMIC FACTORS						1					1	2
SUB-TOTAL	8	13	14	15	7	14	12	14	6	10	24	137

Note. Data are based on 27 primary studies on Asian Americans.

Table 29

Secondary Documents with Asian Americans by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS		2	1	2		5					3	13
EDUCATIONAL FACTORS	3	1		3	1	1	3	6				18
CAREER FACTORS		3		4		2						9
PERSONAL FACTORS									6	6		12
ECONOMIC FACTORS						1						1
SUB-TOTAL	3	6	1	9	1	9	3	6	6	6	3	53

Note. Data are based on nine secondary studies on Asian Americans.

Table 30

Empirical Documents with Asian Americans by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	2	5	5	4		5					3	24
EDUCATIONAL FACTORS	4	5	7	5	4	7	11	13			7	63
CAREER FACTORS	1	3	1	6	2	1					6	20
PERSONAL FACTORS									6	9	6	21
ECONOMIC FACTORS						1					1	2
SUB-TOTAL	7	13	13	15	6	14	11	13	6	9	23	130

Note. Data are based on 26 empirical studies on Asian Americans.

Tables 31-34 show the summaries on Black Americans. These 98 documents, of which two-thirds are empirical studies, represent 14% of all documents. This makes Blacks the most documented minority. Educational curricula are mentioned most often, occurring in 62 studies; and personal attitudes variables are also common, reported in 57 studies. Economic factors -- barriers, in particular -- are considered in 18% of the articles.

Highlights:

- Blacks are the most documented populations.
- Educational curricula and personal attitudes are mentioned frequently.
- Economic barriers are discussed in 18% of the studies.

Table 31

All Documents with Blacks by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	3	17	33	18	2	33					23	129
EDUCATIONAL FACTORS	38	18	39	25	30	40	37	62			29	318
CAREER FACTORS	3	19	8	18	8	13					12	81
PERSONAL FACTORS		3							31	57	17	108
ECONOMIC FACTORS						18					4	22
SUB-TOTAL	44	57	80	61	40	104	37	62	31	57	85	658

Note. Data are based on 98 studies on Blacks.

Table 32

Primary Documents with Blacks by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	2	13	24	12	2	18					21	92
EDUCATIONAL FACTORS	26	14	28	17	17	29	33	43			27	234
CAREER FACTORS	1	15	5	13	5	9					12	60
PERSONAL FACTORS		1							21	40	17	79
ECONOMIC FACTORS						12					4	16
SUB-TOTAL	29	43	57	42	24	68	33	43	21	40	81	481

Note. Data are based on 72 primary studies on Blacks.



Table 33

Secondary Documents with Blacks by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	1	4	9	6		15					2	37
EDUCATIONAL FACTORS	12	4	11	8	13	11	4	19			2	84
CAREER FACTORS	2	4	3	5	3	4						21
PERSONAL FACTORS		2							10	17		29
ECONOMIC FACTORS						6						6
SUB-TOTAL	15	14	23	19	16	36	4	19	10	17	4	177

Note. Data are based on 26 secondary studies on Blacks.

Table 34

Empirical Documents with Blacks by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	2	13	23	12	2	16					20	88
EDUCATIONAL FACTORS	21	14	26	15	14	28	32	39			25	214
CAREER FACTORS	1	15	4	13	4	9					11	57
PERSONAL FACTORS		1							20	36	17	74
ECONOMIC FACTORS						10					3	13
SUB-TOTAL	24	43	53	40	20	63	32	39	20	36	76	446

Note. Data are based on 66 empirical studies on Blacks.

Tables 35-38 show the summaries on Hispanic Americans. These 78 studies, which are two-thirds empirical, represent 11% of all documents. Educational curricula is detailed most often, occurring in 52 documents and personal attitudes is also common, assessed in 42 documents. One item the chart reveals is that half the studies describing educational retention and recruitment are secondary documents. This suggests that new retention/recruitment methods are not being developed.

Highlights:

- Educational curricula and personal attitudes are mentioned frequently.
- Documents reporting educational recruitment and retention are often secondary ones.
- Cultural factors, in particular barriers, are emphasized.

Table 35

All Documents with Hispanics by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	8	17	21	15	3	31					25	120
EDUCATIONAL FACTORS	32	18	29	21	21	31	41	52			24	269
CAREER FACTORS	2	12	4	11	7	6					8	50
PERSONAL FACTORS		2							29	42	22	95
ECONOMIC FACTORS						13					1	14
SUB-TOTAL	42	49	54	47	31	81	41	52	29	42	80	548

Note. Data are based on 78 studies on Hispanics.

Table 36

Primary Documents with Hispanics by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	5	12	16	9		20					20	82
EDUCATIONAL FACTORS	19	12	22	11	12	20	34	36			23	189
CAREER FACTORS	1	8	3	8	4	4					8	36
PERSONAL FACTORS		2							19	31	21	73
ECONOMIC FACTORS						8					1	9
SUB-TOTAL	25	34	41	28	16	52	34	36	19	31	73	389

Note. Data are based on 58 primary studies on Hispanics.

Table 37

Secondary Documents with Hispanics by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	3	5	5	6	3	11					5	38
EDUCATIONAL FACTORS	13	6	7	10	9	11	7	16			1	80
CAREER FACTORS	1	4	1	3	3	2						14
PERSONAL FACTORS									10	11	1	22
ECONOMIC FACTORS						5						5
SUB-TOTAL	17	15	13	19	15	29	7	16	10	11	7	159

Note. Data are based on 20 secondary studies on Hispanics.

Table 38

Empirical Documents with Hispanics by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	5	12	16	9		19					20	81
EDUCATIONAL FACTORS	17	12	21	11	11	20	33	34			23	182
CAREER FACTORS	1	8	3	8	4	4					8	36
PERSONAL FACTORS		2							19	29	21	71
ECONOMIC FACTORS						7					1	8
SUB-TOTAL	23	34	40	28	15	50	33	34	19	29	73	378

Note. Data are based on 56 empirical studies on Hispanics.

Tables 39-42 show the summaries on mixed minorities. Only 14 documents (2%) discuss populations which are identified as a mixture of minorities. This sample size is too small to be particularly significant. However, the lack of economic factors and career factors outlined in the literature is consistent with studies based on other populations.

Highlights:

- No information is available on economic factors.
- Little information is available on career factors.



Table 39

All Documents with Mixed Minorities by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS		1	1	3		2						7
EDUCATIONAL FACTORS	4	1	2	6	2	6	5	10			4	40
CAREER FACTORS				1							2	3
PERSONAL FACTORS									5	8	2	15
ECONOMIC FACTORS												
SUB-TOTAL	4	2	3	10	2	8	5	10	5	8	8	65

Note. Data are based on 14 studies on mixed minorities.

Table 40

Primary Documents with Mixed Minorities by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS		1	1	1		1						4
EDUCATIONAL FACTORS	1	1		4	1	3	3	6			4	23
CAREER FACTORS				1								1
PERSONAL FACTORS									4	5	2	11
ECONOMIC FACTORS												
SUB-TOTAL	1	2	1	6	1	4	3	6	4	5	6	39

Note. Data are based on eight primary studies on mixed minorities.

Table 41

Secondary Documents with Mixed Minorities by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS				2		1						3
EDUCATIONAL FACTORS	3		2	2	1	3	2	4				17
CAREER FACTORS											2	2
PERSONAL FACTORS									1	3		4
ECONOMIC FACTORS												
SUB-TOTAL	3		2	4	1	4	2	4	1	3	2	26

Note. Data are based on six secondary studies on mixed minorities.

Table 42

Empirical Documents with Mixed Minorities by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS		1	1	1		1						4
EDUCATIONAL FACTORS		1		2		3	3	4			3	16
CAREER FACTORS				1								1
PERSONAL FACTORS									3	3	2	8
ECONOMIC FACTORS												
SUB-TOTAL		2	1	4		4	3	4	3	3	5	29

Note. Data are based on six empirical studies on mixed minorities.

Tables 43-46 show the summaries on other populations. These 11 documents (2%) have subjects which are Filipino, Pacific Islanders, Jews, Samoans, Arabs, Indians, and foreign nationals. Conclusions drawn from this sample would probably not be representative of these populations.

Table 43

All Documents with Other Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	1	3	5	1		2					3	15
EDUCATIONAL FACTORS	2	1	2		3	2	5	4			5	24
CAREER FACTORS		3	1	2	1	1					2	10
PERSONAL FACTORS									5	6	3	14
ECONOMIC FACTORS											1	1
SUB-TOTAL	3	7	8	3	4	5	5	4	5	6	14	64

Note. Data are based on 11 studies on other populations.

Table 44

Primary Documents with Other Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	1	3	5	1		2					3	15
EDUCATIONAL FACTORS	2	1	2		3	2	5	4			5	24
CAREER FACTORS		2	1	1	1	1					2	6
PERSONAL FACTORS									5	6	3	14
ECONOMIC FACTORS											1	1
SUB-TOTAL	3	6	8	2	4	5	5	4	5	6	14	62

Note. Data are based on ten primary studies on other populations.

Table 45

Secondary Documents with Other Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS												
EDUCATIONAL FACTORS												
CAREER FACTORS		1		1								2
RACIAL FACTORS												
ECONOMIC FACTORS												
SUB-TOTAL		1		1								2

Note. Data are based on one secondary study on other populations.



Table 46

Empirical Documents with Other Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCOPES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
RURAL FACTORS	1	3	5	1		2					3	15
NATIONAL FACTORS	1	1	1		3	2	5	4			5	22
PEER FACTORS		2		1		1					1	5
PERSONAL FACTORS									5	5	3	13
ECOMIC FACTORS												
TOTAL	2	6	6	2	3	5	5	4	5	5	12	55

Note. Data are based on nine empirical studies on other populations.

Tables 47-50 show the summaries of documents where ethnicity was not specified. These 430 studies, representing 63% of all documents, disallow conclusions across ethnicity to be made. As a result, their significance is decreased. The totals, however, do contribute to trends described earlier in the paper: (1) economic factors are not widely assessed in the current literature, (2) career factors are not widely assessed in the current literature, (3) recruitment is detailed far less than retention, and (4) personal attitudes and educational curricula are the two most frequent factors developed in the literature.

Highlights:

- 63% of the documents do not specify the ethnicity of the populations.
- Economic factors are mentioned only occasionally.
- Little information is available on career factors.
- Retention is documented more often than recruitment.

Table 47

All Documents with Ethnicity - Unspecified Populations by  
Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	28	70	79	92	6	161					66	502
EDUCATIONAL FACTORS	145	46	153	129	95	130	152	225			84	1159
CAREER FACTORS	17	126	30	109	59	98					37	476
PERSONAL FACTORS		17							210	253	92	572
ECONOMIC FACTORS						35					4	39
SUB-TOTAL	190	259	262	330	160	424	152	255	210	253	283	2748

Note. Data are based on 430 studies with populations unspecified.

Table 48

Primary Documents with Ethnicity - Unspecified Populations by  
Factor Categories

Factors	Number within categories											SUB-TOTAL
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	
CULTURAL FACTORS	16	38	62	66	5	96					61	344
EDUCATIONAL FACTORS	97	36	103	83	50	79	129	157			82	816
CAREER FACTORS	6	79	14	52	26	43					35	255
PERSONAL FACTORS		13							155	183	91	442
ECONOMIC FACTORS						20					4	24
SUB-TOTAL	119	166	179	201	81	238	129	157	155	183	273	1861

Note. Data are based on 291 primary studies with populations unspecified.

Table 49

Secondary Documents with Ethnicity - Unspecified Populations by  
Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	12	32	17	26	1	65					5	158
EDUCATIONAL FACTORS	48	10	50	46	45	51	23	68			2	343
CAREER FACTORS	11	47	16	57	33	55					2	221
PERSONAL FACTORS		4							55	70	1	130
ECONOMIC FACTORS						15						15
SUB-TOTAL	71	93	83	129	79	186	23	68	55	70	10	867

Note. Data are based on 39 secondary studies with populations unspecified.

Table 50

Empirical Documents with Ethnicity - Unspecified Populations by  
Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	15	36	58	56	5	89					57	316
EDUCATIONAL FACTORS	85	35	88	71	39	74	121	142			73	728
CAREER FACTORS	5	73	13	48	23	37					31	230
PERSONAL FACTORS		12							141	168	84	405
ECONOMIC FACTORS						19					4	23
SUB-TOTAL	105	156	159	175	67	219	121	142	141	168	249	1702

Note. Data are based on 272 empirical studies with populations unspecified.

### Factors by Sex

Tables 51-62 show information similar to tables 15-50 but categorized by sex. The first set, tables 51-54, discuss factors where the subjects were male and female. These 276 studies, which are three-fourths empirical, represent 41% of all documents. As expected, career factors and economic factors are the least frequently mentioned in the literature.

### Highlights:

- 41% of the documents have populations combining males and females.
- Most studies are empirical.
- Educational curricula and barriers are reported most often.

Table 51

All Documents with Male and Female Populations by Factor  
Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	15	44	58	55	4	93					50	319
EDUCATIONAL FACTORS	91	40	94	73	56	96	116	158			79	803
CAREER FACTORS	4	69	13	50	25	47					28	236
PERSONAL FACTORS		15							139	171	77	402
ECONOMIC FACTORS						22					5	27
SUB-TOTAL	110	166	165	178	85	258	116	158	139	171	239	1787

Note. Data are based on 276 studies with populations of males and females.



Table 52

Primary Documents with Male and Female Populations by Factor  
Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	10	31	50	43	2	67					45	248
EDUCATIONAL FACTORS	71	32	74	57	39	72	106	126			76	653
CAREER FACTORS	1	54	10	35	14	26					27	167
PERSONAL FACTORS		12							112	140	76	340
ECONOMIC FACTORS						16					5	21
SUB-TOTAL	82	129	134	135	55	181	106	126	112	140	229	1429

Note. Data are based on 219 primary studies with populations of males and females.

Table 53

Secondary Documents with Male and Female Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	5	13	8	12	2	26					5	71
EDUCATIONAL FACTORS	20	8	20	16	17	24	10	32			3	150
CAREER FACTORS	3	15	3	15	11	21					1	69
PERSONAL FACTORS		3							27	31	1	62
ECONOMIC FACTORS						6						6
SUB-TOTAL	28	39	31	43	30	77	10	32	27	31	10	358

Note. Data are based on 57 secondary studies with populations of males and females.

Table 54

Empirical Documents with Male and Female Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	10	30	48	38	2	62					42	232
EDUCATIONAL FACTORS	57	32	61	48	30	68	99	113			10	576
CAREER FACTORS	1	53	8	34	11	24					24	155
PERSONAL FACTORS		11							105	128	73	317
ECONOMIC FACTORS						15					4	19
SUB-TOTAL	68	126	117	120	43	169	99	113	105	128	213	1301

Note. Data are based on 203 empirical studies with populations of males and females.

Tables 55-58 summarize the studies on female populations only. These 120 studies, only half of which are empirical, represent 18% of all documents. The lack of empirical studies could indicate a research gap and that a significant amount of the published material may be looking at the same few studies. It is important to note that female studies offer more data on career factors. For example, career expectations are listed in 69 documents (25%) for male/female studies and in 47 documents (39%) for female studies; career retention is cited in 50 documents (18%) for male/female studies and in 42 documents (35%) for female studies; career barriers are reported in 47 documents (17%) for male/female studies and in 43 documents (36%) in female studies! This difference is associated with job/family expectations, job networking, and sex bias, all of which are coding sheet entries for the above listed categories. Unfortunately these career factors are analyzed in as many secondary as primary studies, decreasing the informative nature of the articles. One other disparity between the two subject groups is apparent: the value of educational role models. For male/female populations, 40 articles (14%) discuss educational role models; but for female populations, 9 articles (7%) discuss educational role models. It remains to be seen if the lack of publications on this topic are related to the presence or absence of effective female role models.

#### Highlights:

- Nearly half of the documents are secondary.
- Unlike other populations, career factors are reported often.
- Little information is available on educational role models.

Table 55

All Documents with Female Populations by Factor Categories

actors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
TURAL ACTORS	6	19	22	34	3	49					18	151
ICATIONAL ACTORS	53	9	59	45	31	36	36	62			20	351
IEER ACTORS	8	47	13	42	25	43					11	189
ISONAL ACTORS		2							54	74	19	149
INOMIC ACTORS						9					2	11
I-TOTAL	67	77	94	121	59	137	36	62	54	74	70	851

Note. Data are based on 120 studies with female populations.

Table 56

Primary Documents with Female Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	3	10	17	26	3	28					16	103
EDUCATIONAL FACTORS	37	7	37	30	18	20	30	40			20	239
CAREER FACTORS	4	25	5	16	12	18					10	90
PERSONAL FACTORS		1							39	46	18	104
ECONOMIC FACTORS						6					2	8
SUB-TOTAL	44	43	59	72	33	72	30	40	39	46	66	544

Note. Data are based on 73 primary studies with female populations.

Table 57

Secondary Documents with Female Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	3	9	5	8		21					2	48
EDUCATIONAL FACTORS	16	2	22	15	13	16	6	22				112
CAREER FACTORS	4	22	8	26	13	25					1	99
PERSONAL FACTORS		1							15	28	1	45
ECONOMIC FACTORS						3						3
SUB-TOTAL	23	34	35	49	26	65	6	22	15	28	4	307

Note. Data are based on 47 secondary studies with female populations only.

Table 58

Empirical Documents with Female Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	3	9	15	21	3	25					15	91
EDUCATIONAL FACTORS	33	6	32	26	14	17	28	35			17	208
CAREER FACTORS	3	19	4	11	11	13					7	68
PERSONAL FACTORS		1							31	40	16	88
ECONOMIC FACTORS						5					2	7
SUB-TOTAL	39	35	51	58	28	60	28	35	31	40	57	462

Note. Data are based on 64 empirical studies with female populations.



Tables 59-62 show the summaries of studies where sex is not specified. These 284 documents (42%) indicate the lack of this information in much of the literature. In addition, only one-third of these documents are empirical studies. In general, these studies reference educational scores and curricula as well as personal abilities and attitudes less frequently. Cultural barriers are outlined in over one-third of the studies, suggesting the importance of this topic. Because a gender breakdown is not given in these studies, it is assumed these barriers are ethnic/racial. Upon further investigation, however, cultural barriers are most often listed with populations whose ethnicity and race are not specified. As a result, it is very difficult to draw significant conclusions from these studies or apply any information they contain.

Highlights:

- 42% of the documents do not specify the sex of the population.
- Cultural barriers are cited frequently in the literature.

Table 59

All Documents with Sex Unspecified Populations by Factor  
Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	18	45	43	39	4	97					36	282
EDUCATIONAL FACTORS	96	27	78	69	61	86	73	129			28	647
CAREER FACTORS	8	55	18	65	36	41					16	239
PERSONAL FACTORS		8							95	127	27	257
ECONOMIC FACTORS						31					1	32
SUB-TOTAL	122	135	139	173	101	255	73	129	95	127	108	1457

Note. Data are based on 284 studies with sex unspecified.

Table 60

Primary Documents with Sex Unspecified Populations by Factor  
Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	10	17	27	16	2	34					30	136
EDUCATIONAL FACTORS	36	15	33	25	17	29	44	60			27	286
CAREER FACTORS	2	21	5	21	4	11					13	77
PERSONAL FACTORS		3							43	60	26	132
ECONOMIC FACTORS						14					1	15
SUB-TOTAL	48	56	65	62	23	88	44	60	43	60	97	646

Note. Data are based on 124 primary studies with sex unspecified.

Table 61

Secondary Documents with Sex Unspecified Populations by Factor  
Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	8	28	16	23	2	63					6	146
EDUCATIONAL FACTORS	60	12	45	44	44	57	29	69			1	361
CAREER FACTORS	6	34	13	44	32	30					3	162
PERSONAL FACTORS		5							52	67	1	125
ECONOMIC FACTORS						17						17
SUB-TOTAL	74	79	74	111	78	167	29	69	52	67	11	811

Note. Data are based on 160 secondary studies with sex unspecified.

Table 62

Empirical Documents with Sex Unspecified Populations by Factor Categories

Factors	Number within categories											
	COUNSELING	EXPECTATIONS	ROLE MODEL	RETENTION	RECRUITMENT	BARRIERS	SCORES	CURRICULUM	ABILITY	ATTITUDES	OTHER	SUB-TOTAL
CULTURAL FACTORS	7	15	23	13	2	28					27	115
EDUCATIONAL FACTORS	26	14	26	17	11	24	41	46			21	226
CAREER FACTORS	2	18	4	18	3	8					10	63
PERSONAL FACTORS		3							35	47	21	106
ECONOMIC FACTORS						12					1	13
SUB-TOTAL	35	50	53	48	16	72	41	46	35	47	80	523

Note. Data are based on 102 empirical studies with sex unspecified.

## Cultural Factors

Tables 63-74 show the summaries on studies which discuss cultural factors separated by gender and ethnic/racial groups. Tables 63-66 show the data from populations which are combinations of males and females. The relevant documents (144) represent 21% of the total in the database. Cultural barriers are mentioned in over half these studies. This category includes such variables as sex bias, race bias, and differences perceived in selecting SET majors and careers. Cultural role models, which include such variables as parents' educational level, parents' career, and parental influence, are well publicized also.

Table 63

All Documents with Female and Male Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian	1	3	6	5		6	3	24
Anglo	2	8	14	6	1	10	9	50
Asian American	1	3	3	2		4	3	16
Black	1	9	17	9	2	17	13	68
Hispanic	3	10	12	7	2	13	12	59
Mixed Minority		1	1	1		1		4
Unspecified	13	32	39	45		74	31	234
Other		1	3			1	2	7
TOTAL	21	67	95	75	5	126	73	462

Note. Data are based on 144 studies with populations of males and females.

Table 64

Primary Documents with Female and Male Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian	1	2	4	3		3	3	16
Anglo	2	7	13	6	1	9	9	47
Asian American	1	3	3	2		3	2	14
Black	1	7	14	6	2	10	13	53
Hispanic	3	8	10	4		7	9	41
Mixed Minority		1	1	1		1		4
Unspecified	8	21	34	36		55	30	184
Other		1	3			1	2	7
TOTAL	16	50	82	58	3	89	68	366

Note. Data are based on 112 primary studies with populations of males and females.



Table 65

Secondary Documents with Female and Male Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian		1	2	2		3		8
Anglo		1	1			1		3
Asian American						1	1	2
Black		2	3	3		7		15
Hispanic		2	2	3	2	6	3	18
Mixed Minority								
Unspecified	5	11	5	9		19	1	50
Other								
TOTAL	5	17	13	17	2	37	5	96

Note. Data are based on 32 secondary studies with populations of males and females.

Table 66

Empirical Documents with Female and Male Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian	1	2	4	3		3	2	15
Anglo	2	7	13	6	1	8	9	46
Asian American	1	3	3	2		3	2	14
Black	1	7	14	6	2	9	13	52
Hispanic	3	8	10	4		6	9	40
Mixed Minority		1		1		1		3
Unspecified	8	20	32	31		51	27	169
Other		1	3			1	2	7
TOTAL	16	49	79	53	3	82	64	346

Note. Data are based on 103 empirical studies with populations of males and females.

Tables 67-70 show the data from populations which are females only. The relevant documents (74) represent 11% of the total in the database. Cultural barriers and cultural retention are the largest categories. Cultural retention includes activities like family support. For the most part, the literature indicates females need family support to pursue SET majors and SET careers. As with other data from the populations of all females, the majority of studies have no ethnicity/race specified.

Highlights:

- Cultural barriers are discussed most often.
- Cultural retention, including family support, is well documented in the literature.
- Majority of the documents do not specify ethnicity/race.

Table 67

All Documents with Female only Populations by Cultural Categories

Population	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian						1		1
Anglo				2		2		4
Asian American								
Black			1	1		1	1	4
Hispanic						1		1
Mixed Minority								
Unspecified	6	19	21	32	3	46	17	144
Other								
TOTAL	6	19	22	35	3	51	18	154

Note. Data are based on 74 studies with populations of females.

Table 68

Primary Documents with Female only Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian								
Anglo				2		2		4
Asian American								
Black			1	1		1	1	4
Hispanic						1		1
Mixed Minority								
Unspecified	3	10	16	24	3	26	15	97
Other								
TOTAL	3	10	17	27	3	30	16	106

Note. Data are based on 46 primary studies with populations of females.

Table 69

Secondary Documents with Female only Populations by Cultural Categories

Population	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian						1		1
Anglo								
Asian American								
Black								
Hispanic								
Mixed Minority								
Unspecified	3	9	5	8		20	2	47
Other								
TOTAL	3	9	5	8		21	2	48

Note. Data are based on 28 secondary studies with populations of females.

Table 70

Empirical Documents with Female only Populations by Cultural Categories

Population	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian								
Anglo						1		1
Asian American								
Black			1	1		1	1	4
Hispanic						1		1
Mixed Minority								
Unspecified	3	9	14	21	3	24	14	88
Other								
TOTAL	3	9	15	22	3	27	15	94

Note. Data are based on 39 empirical studies with populations of females.

Tables 71-74 summarize the documents concerning populations for which gender is not specified. The relevant documents (140) represent 21% of the total database. The largest categories are barriers and role models. Studies with Hispanic populations are detailed more than other ethnic/racial groups.

Highlights:

- 21% of the documents discuss cultural factors of subject populations with sex not specified.
- Cultural factors for Hispanic populations are documented more often than other ethnic/racial groups.



Table 71

All Documents with Sex Unspecified Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian	4	6	5	6		8	4	33
Anglo	2	4	5	3		7	5	26
Asian American	1	4	3	4		6	3	21
Black	2	8	15	8		15	9	57
Hispanic	5	7	9	9	1	17	13	61
Mixed Minority				2		1		3
Unspecified	9	19	19	16	3	43	18	127
Other	1	2	2	1		1	1	8
TOTAL	24	50	58	49	4	98	53	336

Note. Data are based on 140 studies with populations not specified by sex.

Table 72

Primary Documents with Sex Unspecified Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian	3	4	4	5		3	3	22
Anglo	2	4	5	3		7	5	26
Asian American	1	2	2	2		2	1	10
Black	1	6	9	5		7	7	35
Hispanic	2	4	6	6		12	11	41
Mixed Minority								
Unspecified	5	7	12	7	2	17	16	66
Other	1	2	2	1		1	1	8
TOTAL	15	29	40	29	2	49	44	208

Note. Data are based on 58 primary studies with populations not specified by sex.

Table 73

Secondary Documents with Sex Unspecified Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian	1	2	1	1		5	1	11
Anglo								
Asian American		2	1	2		4	2	11
Black	1	2	6	3		8	2	22
Hispanic	3	3	3	3	1	5	2	20
Mixed Minority				2		1		3
Unspecified	4	12	7	9	1	26	2	61
Other								
TOTAL	9	21	18	20	2	49	9	128

Note. Data are based on 82 secondary studies with populations not specified by sex.

Table 74

Empirical Documents with Sex Unspecified Populations by Cultural Categories

Populations	Number within categories							
	Counseling	Expectations	Role Model	Retention	Recruitment	Barriers	Other	Total
American Indian	2	3	4	4		3	3	19
Anglo	2	4	5	3		7	5	26
Asian American	1	2	2	2		2	1	10
Black	1	6	8	5		6	6	32
Hispanic	2	4	6	6		12	11	41
Mixed Minority								
Unspecified	4	7	12	5	2	16	16	62
Other	1	2	2	1		1	1	8
TOTAL	13	28	39	26	2	47	43	198

Note. Data are based on 48 empirical studies with populations not specified by sex.

## Interventions

Forty interventions were identified in the literature search. (See Table 75.) By far the largest number were for women, and, of those, the greatest number were in "non-specified" science, meaning that no particulars were given. The largest number of interventions in one category were for minorities in engineering. These were all products of the programs of the National Action Council for Minority Engineering (NACME).

NACME is a unique organization with branches across the United States. It has a track record of success, and began in the 1970s. NACME is a non-profit organization founded by businesses, industries, foundations, universities, professional societies, and common concern organizations. It actively works to increase the number of minorities (Blacks, Mexican Americans, Puerto Ricans, and American Indians) graduating from accredited engineering schools.

NACME calls its college programs "Minority Engineering Programs (MEPs)". Although not all programs have all components, a "model" program provides services in the areas of recruitment, admissions, tutoring, counseling, and summer employment. The MEPs are described very well by Raymond B. Landis (1985:7)<sup>3</sup>.

"Although certain aspects of the Minority Engineering Programs (MEPs) vary somewhat, the programs share common features: they are generally based within an engineering academic unit; all are dedicated to delivering services to minority engineering students to enhance their academic performance, retention, and graduation; and most attempt to accomplish a great deal with limited resources and therefore must be as cost effective as possible."

## Levels of Interventions

Most interventions were directed at high school or college students. There were a few exceptions, such as the NSF Career Facilitation Projects and some teacher/staff inservice programs. The interventions which were directed at teachers or other school personnel, existed ultimately to affect the student population these people served. The only intervention directed at post-college women to help them

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<sup>3</sup>Landis, Raymond B., Ed. (1985). Improving the Retention and Graduation of Minorities in Engineering. Handbook. New York, NY: NACME, Inc.

establish careers in SET fields were the Career Facilitation Projects. The centerpiece of this intervention was an educational program, at a college, to update skills in a scientific field.

Table 75

Interventions by Population and Subject Area

Subject	Population		
	WOMEN (22)	WOMEN & MINORITIES (5)	MINORITIES (13)
NONSPECIFIED SCIENCE	(9) role models.....4 hands-on experience..1 peer support.....1 instruction.....4 counseling.....7 field trips.....1 tutoring.....1 high school recruit..1		
PHYSICS	(1) role models hands-on experience peer support instruction counseling		(1) hands-on instruction financial assistance parent involvement field trip
CHEMISTRY	(2) role models.....1 hands-on experience..1 instruction.....2 counseling.....1		
ENGINEERING	(6) role models.....5 hands-on experience..4 peer support.....1 instruction.....5 financial assistance..1 parent involvement...1 counseling.....2 field trips.....3	(5) role models.....1 internship.....2 hands-on.....1 instruction.....3 financial assistance..4 parent involvement...1 counseling.....2 field trip.....3 tutoring.....1 high school recruit..1	(12) internship.....1 hands on.....1 instruction.....6 parent involvement..1 counseling.....7 tutoring.....5 peer support.....5
MATHEMATICS	(4) role models.....1 hands-on experience..1 peer support.....1 instruction.....4 counseling.....4 tutoring.....1		

## CONCLUSIONS AND IMPLICATIONS

In this interim report, conclusions can only be preliminary ones. The Results section tabulated:

- The variables researchers have measured in studying the issue of minority and female participation in SET study and careers.
- The strategic approaches that have been used in attempting to remedy the underrepresentation of these groups.
- The research gaps.

A breakdown is given for the Cultural Factors classification, covering the categories of counseling, expectations, role model, retention, recruitment, and barriers. The findings are similar in other factor classifications of Educational, Career, Economic, and Personal.

### Preliminary Conclusions

- There is a paucity of data on ethnic and racial groups, especially when linked to sex.
- Economic variables are the least frequently studied.
- Virtually no information on cost or cost effectiveness of interventions has been published.
- The best models for male minority interventions are the NACME models.
- There are few longitudinal or follow-up studies.
- More research and interventions have been conducted on math anxiety for women than for men.
- Curricula do not contain enough "hands-on" or laboratory work for populations who need to make up a "technical gap".
- The Federal government is the major funder for research in this area.
- Work remains culturally defined, i.e. some careers are "fenced" in ways which keep women out; women's work and men's work are a division of labor concept in America.



- Reasons for the high incidence of Asian Americans in SET careers are not well-documented but center on rarely operationalized or tested concepts such as "family" and "culture."

### Implications

- There is a need for more specialized research design, targeting discrete populations of female and male American Indians, Asian Americans, Blacks, and Hispanics.
- The lack of longitudinal or follow-up studies means that evaluation and cost effective measures are inadequate so the benefit of the research is difficult to assess.
- A systematic program of interventions is the only method to produce the data in a way which can be measured, compared and evaluated.
- Women and minorities are still paid less than white males and receive fewer rewards such as tenured positions, suggesting that underrepresentation may be related to the lesser benefits for them relative to the expectations, effort, and time expended.
- There is a need to determine the cultural reasons minorities avoid math and science.
- A reconciling mechanism may be necessary in order to bridge the gap between the pluralistic aspects of some minority cultures and the individualistic aspects of competition in college and careers.
- There may be an Occupational Adaptation Syndrome (OAS) experienced by minorities and women as they seek to enter non-traditional careers, causing value and culture conflict. Math and science anxiety may be aspects of a larger, more generalized problem—that of an inadequate adaptive response to unfamiliar situations and behaviors. The tension, stress, and strains arising from stereotyping, variance in values, and cultural anomalies appears to compound resulting in adaptive system overload and subsequent drop-out from SET study and careers.

## APPENDIX A

### Potential Journal Sources of SET Documents

SUBJECT	ESTIMATED NUMBER OF APPROPRIATE JOURNALS
Aeronautics and Space Flight	138
Anthropology	50
Architecture	56
Biology	59
Business and Economics	170
Chemistry	80
Computers	95
Education	273
Electricity and Electrical Engineering	118
Engineering	161
Environmental Studies	126
Ethnic Interests	107
History	102
Industrial Health and Safety	50
Mathematics	63
Metallurgy	53
Military	121
Physics	70
Public Administration	93
Sciences: Comprehensive Works	100
Social Sciences: Comprehensive Works	73
Sociology	99
Technology: Comprehensive Works	65

Women's Interest

111

TOTAL 2,433

APPENDIX B  
Categorization of Documents from Data File Searches

FILE

GROUP	ABI INFORM	AEROSPACE	AIM/ARM	AMERICA: HISTORY & LIFE	ASI	A-V. ONLINE (NICEM)	CA SEARCH 1967 - 71	CA SEARCH 1972 - 76
American Indians	7	1	21	76	209	25		1
	2	1	1	0	30	0		0
Asian Americans	3	0	7	15	19	6		0
	2		1	14		4		
Black Americans	0		0	0		0		
	0		1	4		1		
Hispanic Americans	29	2	60	27		68		1
	11	0	3	5		1		0
Women	2	0	26	6		17		0
	66		16	155		35		
	2		3	0		3		
	19		7	36		8		
	148	85	17	42		59		13
	29	13	3	6		27	4	0
	18	0	6	2		6		0

Note: Numbers above the diagonal refer to A criteria; numbers below refer to B criteria.  
(See Appendix C for criteria.)

FILE

GROUP	CA SEARCH 1977 - 79	CA SEARCH 1980 - 81	CA SEARCH 1982 - 85	CENDATA	COMPENDEX	CONFER- ENCE PAPERS INDEX	DISSERTA- TION ABS- TRACTS ONLINE	ERIC
American Indians	1 0			55	4	3	92	345
						0	2	127
						0	34	78
Asian Americans						1	47	285
						0	2	16
						0	16	99
Black Americans	1	1	2	11	3	5	35	388
	0	0	0		2	0	11	
	0	0	0		0	0	6	
Hispanic Americans				3	1	14	32	290
					1	0	7	96
					0	3	14	89
Women		1	4	86	78	66	217	1785
		0	0		25	17	89	585
		0	0		0	3	32	318

Note: Numbers above the diagonal refer to A criteria; numbers below refer to B criteria.  
(See Appendix C for criteria.)

FILE

GROUP	FEDERAL RESEARCH IN PROGR- ESS	FIND/SVP REPORTS & STUDIES INDEX	GPO MONTHLY CATALOG	HARVARD BUSINESS REVIEW	HISTORI- CAL ABST- RACTS	INFORMA- TION SCI- ENCE ABS- TRACTS	INSPEC	MAGAZINE INDEX
	20		10		4	6	4	14
American Indians	0 0	0 2	0 2	0 1	0 0	0 0	0 0	0 1
	6		6	1		3		2
Asian Americans	0 0	0 1	0 1	0 0	0 0	0 0	0 0	0 1
	33		34	19	44	6		20
Black Americans	0 1	4 20	4 20	0 3	0 0	0 0	0 0	12 1
	45		33	12	30	15		57
Hispanic Americans	0 0	1 5	1 5	0 1	0 0	2 0	0 0	1 26
	47	8	7	59	7	86	29	42
Women	6 1	0 0	7 0	0 12	0 0	6 6	19 0	14 0

Note: Numbers above the diagonal refer to A criteria; numbers below refer to B criteria.  
(See Appendix C for criteria.)

FILE

GROUP	MANAGEMENT CONTENTS	(MATH)FILE MATHSCI	NATIONAL NEWSPAPER INDEX	NTIS	PSYCALERT	PSYCINFO	SCISEARCH	SOCIAL SCISEARCH
American Indians	2 0		5 0	382 4	4 0	225 1	3 0	28 0
Asian Americans			1 6	23 28	1 1	54 91	0 1	3 21
Black Americans	84 1	1 0	32 4	115 23	28 0	83 13	6 0	103 0
Hispanic Americans	18 0		26 0	27 6	11 0	35 5	11 0	140 0
Women	97 11	12 3	11 6	155 60	85 2	376 7	67 7	29 14
	15	0	1	8	29		4	2

Note: Numbers above the diagonal refer to A criteria; numbers below refer to B criteria.  
(See Appendix C for criteria.)

GROUP	SOCIOLOG- ICAL ABS- TRACTS	SPIN	SSIE CURRENT RESEARCH			Total No. of Categorized Items	Total No. of Files	Total No. of Items
American Indians	75		66			1488	28	1688
						168		
						247		
Asian Americans		2	67			589	20	589
						18		
		0	0			160		
Black Americans	81		104			1230	30	1426
						90		
						205		
Hispanic Americans	21	1	75			930	25	1169
						127		
		0				234		
Women	290	5	193			3265	33	4210
						951		
		2				463		
Grand Total						7502	136	9082
						1354		
						1309		

Note: Numbers above the diagonal refer to A criteria;  
numbers below refer to B criteria. (See Appendix  
C for criteria.)



## APPENDIX C

### CRITERIA FOR INCLUSION IN CASET DATABASE

Categories A through D include the following:

- Membership in subgroup of American Indian, Asian American, Black, Hispanic, or women.
- United States of American citizenship.
- Published document, including bibliographies, presented papers, and government reports.

Additional criteria for each specific category must be:

A. Highest Criteria

1. About a SET subject.
2. About a ninth grade or above, postsecondary education, vocational training, or employment.

B. Second Highest Criteria

1. Not about specific academic majors or occupation but is concerned with information or data about education, training, and jobs.
2. About a ninth grade or above, postsecondary education, vocational training, or employment.

C. Third Highest Criteria

1. About majors or occupations which are tangential to SET, such as the life sciences (medicine, biology, nutrition, paramedical training, dentistry); geography; meteorologist; heat-transfer technician; television; and radio repair person.
2. About a ninth grade or above, postsecondary education, vocational training, or employment.

D. Fourth Highest Criteria

1. About majors, courses of study, or occupations which are not SET or tangential to SET. Could be about subjects such as the social and behavioral sciences, law, business, English, foreign languages, and the non-SET trades.
2. About a ninth grade or above, postsecondary education, vocational training, or employment.

APPENDIX D  
CODING SHEET

I. A. ACCESSION NUMBER: \_\_\_\_\_

B. DATABASE/FILE: \_\_\_\_\_ DATE OF RETRIEVAL: \_\_\_\_\_

II. AUTHOR (Personal): \_\_\_\_\_  
(Organizational): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

III. TITLE: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

IV. SOURCE: \_\_\_\_\_  
Volume/Issue: \_\_\_\_\_ Page: \_\_\_\_\_ Year: \_\_\_\_\_  
Report No.: \_\_\_\_\_ Contract Grant No.: \_\_\_\_\_  
Sponsoring Organization(s): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

V. DOCUMENT TYPE:

1. Book	8. Conference Paper
2. Book Chapter	9. Bibliography
3. Journal	10. Audio-Visual
4. Government Report	11. Instructional Materials
5. Industry Report	12. Manual or Handbook
6. Dissertation	13. College Report
7. Unpublished Manuscript	14. Other, specify _____

VI. AVAILABILITY: \_\_\_\_\_

VII. GOAL AND FOCUS:

- |  |                         |
|--|-------------------------|
| 1. Empirical Study (Including<br>Intervention Project Reports<br>and Surveys | 4. Position Paper       |
| 2. Research Review   | 5. Anecdotal            |
| 3. Theoretical Review  | 6. Case Study           |
|  | 7. Evaluation Report    |
|  | 8. Other, specify _____ |

VIII. SETTINGS OF RESEARCH:

A. TYPE OF ORGANIZATION:

- |                |                         |
|----------------|-------------------------|
| 1. Educational | 3. Governmental         |
| 2. Industrial  | 4. Other, specify _____ |

B. LOCATION: City \_\_\_\_\_ State \_\_\_\_\_ Not Specified \_\_\_\_\_  
Other, specify \_\_\_\_\_

C. IF EDUCATIONAL, NAME OF INSTITUTION: \_\_\_\_\_

1. Type of Institution: Public \_\_\_\_\_ Private \_\_\_\_\_ Proprietary \_\_\_\_\_  
Other, specify \_\_\_\_\_
2. Type of Degree given: HS Diploma \_\_\_\_\_ AS \_\_\_\_\_ BS \_\_\_\_\_ MS \_\_\_\_\_ PhD \_\_\_\_\_  
Certificate \_\_\_\_\_ Other \_\_\_\_\_ Not Specified \_\_\_\_\_
3. Student Body: Coed \_\_\_\_\_ F Only \_\_\_\_\_ M Only \_\_\_\_\_
4. Religious Affiliation: Yes \_\_\_\_\_ No \_\_\_\_\_ Denomination \_\_\_\_\_
5. Technical/Vocational Institute: Yes \_\_\_\_\_ No \_\_\_\_\_ Not Specified \_\_\_\_\_
6. Size of Undergraduate Population:  
\_\_\_\_\_ <1,000 \_\_\_\_\_ 1,000-10,000 \_\_\_\_\_ >10,000

(Coding Sheet)

D. IF INDUSTRIAL, NAME: \_\_\_\_\_  
Other, specify \_\_\_\_\_

1. Type of Industry (use SIC Code) \_\_\_\_\_

2. Size of organization and number of personnel \_\_\_\_\_

E. IF GOVERNMENTAL, NAME: \_\_\_\_\_  
Other, specify \_\_\_\_\_

Civilian \_\_\_\_\_ Military \_\_\_\_\_ Laboratory \_\_\_\_\_

IX. FUNDING OF RESEARCH

Public \_\_\_\_\_ Corporate \_\_\_\_\_ Non-Profit \_\_\_\_\_ Other \_\_\_\_\_ Not Specified \_\_\_\_\_

X. EVALUATION COMPONENT: Yes \_\_\_\_\_ No \_\_\_\_\_ Internal \_\_\_\_\_ External \_\_\_\_\_

XI. COST COMPONENT: Yes \_\_\_\_\_ No \_\_\_\_\_

1. Cost of the Project/Intervention/Program \_\_\_\_\_ Unit Cost \_\_\_\_\_

2. Cost of the Evaluation \_\_\_\_\_ Unit Cost \_\_\_\_\_

3. Cost of the Study \_\_\_\_\_ Unit Cost \_\_\_\_\_

4. Other, please specify \_\_\_\_\_

XII. TYPE OF STUDY:

Primary \_\_\_\_\_ Secondary \_\_\_\_\_

(Coding Sheet)

NOTE: If coding secondary articles, just place checks.  
If coding primary articles, enter numbers (if present) or  
else, place checks.

XIII. POPULATION CHARACTERISTICS

	<u>Total</u>	<u>Male</u>	<u>Female</u>
A. American Indian	_____	_____	_____
B. Anglo	_____	_____	_____
C. Asian American	_____	_____	_____
D. Black	_____	_____	_____
E. Hispanic	_____	_____	_____
F. Mixed Minority	_____	_____	_____
G. Mixed Minority & Other	_____	_____	_____
H. Other (specify)	_____	_____	_____
And code	_____	_____	_____

NOTE: For the balance of the Coding Sheet:  
If the article is primary, enter checks under the appropriate  
columns  
If the article is secondary, circle the capital letters which  
represent factors discussed.

XIV. CULTURAL FACTORS

	<u>Mentioned Only:</u>	<u>Unfavor- able:</u>	<u>Favor- able:</u>	<u>Inter- vention:</u>
A. COUNSELING/GUIDANCE				
1. Consult Father	_____	_____	_____	_____
2. Consult Mother	_____	_____	_____	_____
B. EXPECTATIONS				
1. Family expectations	_____	_____	_____	_____

**C. ROLE MODEL**

	Mentioned Only:	Unfavor- able:	Favor- able:	Inter- vention:
1. Mother in related career	_____	_____	_____	_____
2. Father in related career	_____	_____	_____	_____
3. Mother's educational level	_____	_____	_____	_____
4. Father's educational level	_____	_____	_____	_____

**D. RETENTION**

1. Family moral support	_____	_____	_____	_____
-------------------------	-------	-------	-------	-------

**E. RECRUITMENT**

**F. BARRIERS**

	Mentioned Only:	Yes:	No:	Inter- vention:
1. Differences per- ceived in status of SET careers	_____	_____	_____	_____
2. Sex Bias	_____	_____	_____	_____
3. Race Bias	_____	_____	_____	_____

**XV. EDUCATIONAL FACTORS**

**A. COUNSELING**

	Mentioned Only:	Unfavor- able:	Favor- able:	Inter- vention:
1. Academic counseling	_____	_____	_____	_____

	Mentioned Only:	Unfavor- able:	Favor- able:	Inter- vention:
2. Career counseling matching individuals with majors	_____	_____	_____	_____
3. Academic tutoring	_____	_____	_____	_____
 B. EXPECTATIONS				
 C. ROLE MODEL				
1. Teacher, counselor, employer, profes- sional role models	_____	_____	_____	_____
 D. RETENTION				
1. Support from author- ities	_____	_____	_____	_____
2. Internships and work study programs	_____	_____	_____	_____
3. Peer support groups	_____	_____	_____	_____
 E. RECRUITMENT				
1. Policies on women and minorities	_____	_____	_____	_____
2. Support from author- ities	_____	_____	_____	_____
 F. BARRIERS				
	Mentioned Only:	Yes:	No:	Inter- vention:
1. Type of high school	_____	_____	_____	_____

	Mentioned Only:	Yes:	No:	Inter- vention:
2. Teacher Qualifications	_____	_____	_____	_____
3. Sex bias	_____	_____	_____	_____
4. Race bias	_____	_____	_____	_____
6. Instructional materials	_____	_____	_____	_____

G. SCORES

	Mentioned Only:	Unfavor- able:	Favor- able:	Inter- vention:
1. SAT/ACT	_____	_____	_____	_____
2. Other specialized tests	_____	_____	_____	_____
3. G.P.A.	_____	_____	_____	_____
4. Rank	_____	_____	_____	_____

H. CURRICULUM

1. Adequate H/S math and science subjects	_____	_____	_____	_____
2. Extra-curricular SET programs	_____	_____	_____	_____
3. Math Anxiety	_____	_____	_____	_____
4. Other specialized courses	_____	_____	_____	_____
5. Extra-curricular non-SET activities	_____	_____	_____	_____

XVI. CAREER FACTORS

A. COUNSELING



(Coding Sheet)

	Mentioned Only:	Unfavor- able:	Favor- able:	Inter- vention:
<b>B. EXPECTATIONS</b>				
1. Job/career expect- tations	_____	_____	_____	_____
2. Advancement oppor- tunity	_____	_____	_____	_____
<b>C. ROLE MODELS</b>				
1. Mentor	_____	_____	_____	_____
<b>D. RETENTION</b>				
1. Wages and salaries	_____	_____	_____	_____
2. Advancement oppor- tunity	_____	_____	_____	_____
3. On-the-job peer support group	_____	_____	_____	_____
<b>E. RECRUITMENT</b>				
1. Networking for job contacts	_____	_____	_____	_____
<b>F. WORK EXPERIENCE</b>				
1. Military	_____	_____	_____	_____
2. Non-Military	_____	_____	_____	_____
<b>G. BARRIERS</b>				
	Mentioned Only:	Yes:	No:	Inter- vention:
1. Sex bias	_____	_____	_____	_____
2. Race bias	_____	_____	_____	_____

**XVII. PERSONAL FACTORS**

**A. ABILITY**

	Mentioned Only:	Unfavor- able:	Favor- able:	Inter- vention:
1. Skills for stress management	_____	_____	_____	_____
2. Aptitude	_____	_____	_____	_____
3. Hand/eye coordin- ation	_____	_____	_____	_____
4. Male/female math and spatial differences	_____	_____	_____	_____
5. Adaptive capability (e.g., career re- cycling)	_____	_____	_____	_____

**B. ATTITUDES**

1. Interest in SET	_____	_____	_____	_____
2. Attitude toward math/science	_____	_____	_____	_____
3. Recognition of SET ob- jectives for career	_____	_____	_____	_____
4. Study habits	_____	_____	_____	_____
5. Motivated toward achievement	_____	_____	_____	_____
6. Self-concept, image, self-confidence, identity	_____	_____	_____	_____

**C. EXPECTATIONS**

**D. VALUES**

**XVIII. ECONOMIC FACTORS**

**A. FINANCIAL SUPPORT**

	Mentioned Only:	Unfavor- able:	Favor- able:	Inter- vention:
1. Grant	_____	_____	_____	_____
2. Scholarship	_____	_____	_____	_____
3. Internship	_____	_____	_____	_____
4. Work Study	_____	_____	_____	_____

**B. BARRIERS**

	Mentioned Only:	Yes:	No:	Inter- vention:
1. Financial support availability	_____	_____	_____	_____
2. Effect work on study time	_____	_____	_____	_____
3. Sex bias	_____	_____	_____	_____
4. Race bias	_____	_____	_____	_____

**XIX. RESEARCH METHODS USED:**

**A. TYPE OF DATA USED:** Cross-sectional \_\_\_\_\_ Longitudinal \_\_\_\_\_

**B. MEASUREMENT (College):** Follow-up \_\_\_\_\_

1. Recruitment
2. Retention
3. Dropout
4. Stopout
5. Graduation
6. Grade Point Average
7. Quality of school life
8. Change of attitude
9. Transfers:
  - a) From where
  - b) To where

(Coding Sheet)

- c) 2 year to 4 year college
- d) 2 year to 4 or more college
- e) 4 year to 4 year college
- f) 4 or more year to 4 or more year college
- g) 4 year to 2 year college

C. MEASUREMENT (For career path or industry):

- 1. Recruitment
- 2. Retention (staying at the same career)
- 3. Length of service at individual company
- 4. Job satisfaction
- 5. Other, please specify \_\_\_\_\_

D. MEASUREMENT

(Vocational/Technical)

- 1. Recruitment
- 2. Dropout
- 3. Graduation
- 4. Grade average
- 5. Quality of school life
- 6. Other, please specify \_\_\_\_\_

E. MEASUREMENT

(High School)

- 1. Recruitment
- 2. Dropout
- 3. Graduation
- 4. Grade average
- 5. Quality of school life
- 6. Other, please specify \_\_\_\_\_

(Coding Sheet)

NOTE: This page is for internal file manipulation. If the items listed below have been checked at any point while you coded this article, place an "X" in the space provided.

XX.	_____	Counseling
XXI.	_____	Expectations
XXII.	_____	Role Model
XXIII.	_____	Retention
XXIV.	_____	Recruitment
XXV.	_____	Barriers
XXVI.	_____	Scores (SC)
XXV.	_____	Curriculum (CC)
XXVI.	_____	Work Experience (WX)
XXV.	_____	Ability (AB)
XXVI.	_____	Attitudes (AT)
XXVII.	_____	Financial Support
XXVIII.	_____	Values (VA)
XXIX.	_____	Measurement*
XXX.	_____	Intervention
XXXI.	_____	Sex Bias
XXXII.	_____	Race Bias
XXXIII.	_____	Internship
XXXIV.	_____	SAT
XXXV.	_____	GPA
XXXVI.	_____	Math Anxiety
XXXVII.	_____	Military
XXXVIII.	_____	Self

\*Note: An "X" here means at least one measurement was recorded on pages 10-11, #XIX.

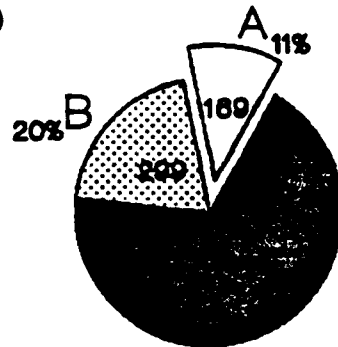
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Coder's Name

# APPENDIX E COMPUTERIZED SEARCH PER GROUP

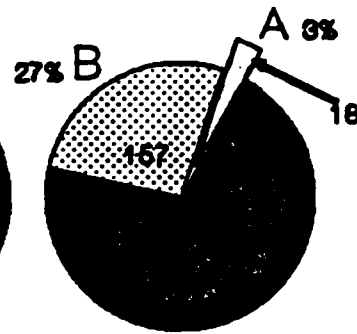
American Indians

(1488)



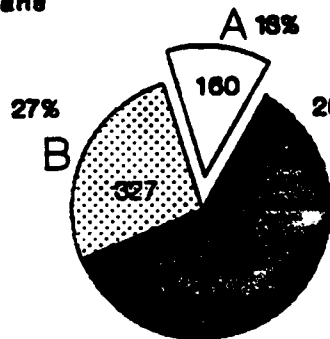
Asian Americans

(589)



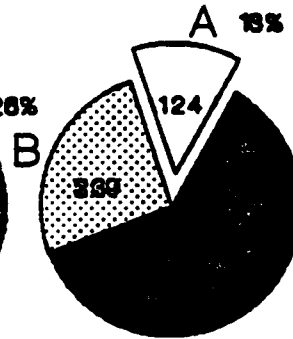
Black Americans

(1230)



Hispanic Americans

(930)



Women

(3265)

